For the reasons set forth below, the rejection of the claims is respectfully traversed.

Applicant respectfully disagrees with the Examiner's interpretation of Mills. In particular the statement, "...any general purpose computer can be programmed to be a digital data decoder, and NTP can be implemented on any general purpose computer." has been used to imply that all allowable implementations for NTP are sufficient for implementing a complaint MPREG-2 system. The inventor is not aware of any software which implements a compliant MPREG-2 decoder. The inventor has worked with most of the major suppliers of MPEG-2 compliant decoders and does not know of any of them which have implemented the system on a general purpose computer. In the U.S., the two major service providers of digital television are DirecTV and EchoStar. If it was possible to implement a compliant MPEG-2 decoder on a general purpose computer, then they would offer an option to use a home PC rather than requiring consumers to purchase a separate STB. The following technical requirements for an MPEG-2 decoder prevent a general purpose computer from being used for that function.

First, an MPEG-2 system requires constant delay for the arrival of the time stamps and content to work successfully. The decoder hardware must maintain this constant delay when receiving the time stamps. All known implementation use a hardware solution to capture the time stamps, because capturing the time stamps in software introduce a variable delay. This is not a problem, it may be noted, for systems implementing NTP, because the accuracy requirement is approximately one second. Also the time stamps used for NTP are not delivered with constant delay over a network.

Second, an MPEG-2 decoder requires a stable clock source whose frequency can be adjusted by approximately plus or minus 100 ppm. This frequency is specified to be 27MHz,

which is the granularity of the time stamps. All clock sources for MPEG-2 decoders are based on a VCXO. While a possible VCXO based system is described in appendix G of Mills, general purpose computers do not contain this type of clock source.

Third, the processor in an MPEG-2 decoder typically runs a real-time operating system (RTOS), so that it handles interrupts such as those necessary to implement the software portion of the clock recovery algorithm within an acceptable delay.

An MPEG-2 system should not be confused with other digital media sources such as DVD. One important distinction is that the rate of data delivery can be controlled by the decoder in a DVD type system, but in an MPEG-2 system, the decoder does not have that control and must perform clock recovery correctly for the system to perform without artifacts.

Can the Examiner point to a general purpose computer which implements a compliant MPEG-2 decoder?

Applicant is unable to find in Mills, where "A method for determining the difference between local and remote clock frequencies and time values, and for adjusting the local clock frequency so that the difference approaches zero is fully disclosed by Mills." The difference in time values is prior art, but the difference in clock frequencies is not. Even if the difference between the local and remote clock frequencies are determined, the algorithm in the patent application uses that difference to control the feedback loop. The disclosed algorithm also causes both the difference in frequency and the difference in time values to approach zero at the same time. In prior art, adjustments based on time values are used and will over time cause the difference in frequency to approach zero over a long period of time. The patent application describes a technique where they both approach zero more rapidly.

In response to the reference to pp. 40 sec. 5 Local Clocks, the referenced sentence is ill formed and its intent is not clear. The sentence is "This section describes the Fuzzball local-clock model and implementation, which includes provisions for precise time and frequency to within 0.3ms per day." The last phrase is not clear since the units for frequency are cycles per second rather than seconds/day. If there is any error of 0.3ms per day, then it is not clear how it is possible that the time can be with 15 ns. There are several orders of magnitude of difference these two values. Also, it is not known what assumptions and parameters were used to make this statement. For example, Appendix H describes some of the various errors which may appear in an NTP system and many of these exceed "several nanoseconds" as indicated by the patent examiner.

There are other important differences between the NTP algorithm and the preferred algorithm described in the patent application.

For example, the amount of time needed to lock the local clock to the incoming time stamps is very important for digital television decoders. The algorithm described in the patent application typically locks within seconds. In the examples given near the end of Appendix G in Mills, the locking time is measured in hours, which is not acceptable for digital television decoding. Unlike NTP, the source time base can change at any time due to a number of reasons, including a time base discontinuity in the incoming stream or the user changes channels and hence a possible new time base.

Also, the NTP algorithm and other prior art reviewed, do not use the difference in frequency in addition to the difference in time to adjust the control loop. This is an important aspect of the preferred embodiment of this invention. This algorithm allows results described above and below to be achieved.

Still further, the algorithm described in the patent application is less computationally intensive and requires less memory storage than the NTP algorithm. This is relevant because it reduces the cost of the system, in a market which is sensitive to price. Since the algorithm runs in less time, the processor cycles may be used for another purpose or the processor may be shut down more often to save power.

Claim 1 covers the method for determining the difference between the local and program clock frequencies. It is important to note that this is different than determining the difference in time maintained by the local and source clocks, which has been well described in prior art. The prior art typically passes a series of these time differences through a filter for adjusting the frequency as illustrated in the algorithm used by NTP in Appendix I.

The present invention, as defined by Claims 1, 6 and 11, includes several important elements of the clock recovery techniques which can be used for MEPG-2 systems. Specifically, the invention computes not only the difference in between the PCR and S.C., but also the frequency difference between the remote and local clocks. Moreover, the present invention, as defined by Claims 1, 6 and 11, adjusts the frequency of the local clock so that this frequency difference approaches zero.

The present invention not only monitors the difference between the PCR and the S.C., but also the difference in frequencies between the local and remote clocks. Using both of these values, the feedback control loop quickly brings both of the differences closer to 0. An important advantage is that this invention locks the local clock to the remote clock much sooner than the prior art.

Because of the above-discussed differences between Claims 1, 6 and 11, and because of the advantages associated with those differences, Claims 1, 6 and 11 patentably distinguish

over the prior art and are allowable Claims 2-5 are dependent from Claim 1 and are allowable therewith. Also, Claims 7-10 are dependent from Claim 6 and are allowable therewith, and Claim 12 is dependent from, and is allowable with Claim 11. The Examiner is thus respectfully requested to reconsider and to withdraw the rejections of Claims 1, 2, 6, 11 and 12, and the objections to Claims 3-5 and 7-10, and to allow Claims 1-12.

If the Examiner believes that a telephone conference with Applicant's Attorneys would be advantageous to the disposition of this case, the Examiner is requested to telephone the undersigned.

Respectfully submitted,

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